

13. VEGETATION—BRISTOL BAY DRAINAGES

13.1 Introduction

The vegetation study describes the predominant vegetation types found in the mine and transportation-corridor study areas in the Bristol Bay drainages. This information also helps to support wetland and habitat studies. The specific objectives of the vegetation study are as follows:

- Customize an existing vegetation classification system to include Project Vegetation Types amenable to photo-interpretation.
- Provide descriptions of Project Vegetation Types.
- Map Project Vegetation Types in the mine mapping area and transportation-corridor mapping area (within the respective study areas).
- Compile and document information on plant species observed.

The objectives and methodology used were essentially identical in the both the mine and transportation-corridor study areas. The vegetation study overlaps with and provides support for the wetlands study (as described below) and habitat mapping for terrestrial wildlife (Chapter 16, Section 16.1). Vegetation data were collected from 2004 through 2008 and were analyzed by Three Parameters Plus, Inc. and HDR Alaska, Inc.

Vegetation field data were collected as part of the wetland mapping program. Because the vegetation study was conducted as part of the wetland studies (Chapter 14), study sites were selected primarily to assist in the identification and mapping of wetlands and non-wetlands. Study sites also were selected to ensure data collection from each Project Vegetation Type across landscapes and soil types, as noted both on aerial photographs and while conducting field work.

Researchers analyzed vegetation data and aerial photo signatures to develop a system for describing and identifying Project Vegetation Types for the Pebble Project. This classification system (3PPI, 2008) is based on an existing standard vegetation classification system (Vioreck et al, 1992; Wibbenmeyer et al, 1982) modified to accommodate interpretation of available aerial imagery. Forty-seven Project Vegetation Types have been defined in the Bristol Bay drainages study areas.

Vegetation mapping was completed for mapping areas of approximately 128,000 acres within the mine study area (Figure 13-1) and approximately 20,000 acres within the transportation-corridor study area (Figure 13-2).

Vegetation data collected at detailed-data collection plots included estimates of the percent cover of each plant species, site photographs, and initial classification of the Project Vegetation

Type. The classification system incorporated information on canopy cover, needleleaf versus broadleaf tree species, shrub height and density, and dominant species.

For clearer display on maps, the Project Vegetation Types in each study area were aggregated into 10 Grouped Vegetation Types based on the dominant structure and growth form (forested, shrub, or herbaceous), vegetation density (open or closed canopy), and average height (dwarf, low, or tall).

A list of observed vascular plant species was developed, including incidental observations of non-vascular plant species and species considered rare by the Alaska Natural Heritage Program. For rare species observations, supporting data were collected, and a plant sample (voucher specimen) was taken if the population was large enough to support loss of a specimen.

All data from the vegetation study have been entered into a relational database for the Pebble Project.

13.2 Results and Discussion

13.2.1 Mine Study Area

The mine study area is located within a continental climate characteristic of interior Alaska and consists of one ecological zone (low scrub shrub).

Researchers collected data at 16,947 sites in the mine study area. These included limited-data collection sites, detailed-data collection sites, and shrub height study sites. Researchers then compared vegetation data from the field and site photographs to aerial photo signatures to produce a vegetation map for the approximately 128,000-acre mine mapping area within the mine study area. Forty-five Project Vegetation Types were identified and described using information from 3,300 detailed-data collection plots within the mapped area.

Shrub vegetation types represented 81 percent of the area mapped, with dwarf shrub types being most common. Open water or unvegetated/sparsely vegetated land cover types represented 10 percent of the area, and herbaceous vegetation types represented about 9 percent. Forested vegetation types represented less than 1 percent of the area mapped. Table 13-1 lists the Grouped Vegetation Types for the mine mapping area, with the acreage of each and the percentage of the mine mapping area that each type comprises.

Three plant species tracked by the Alaska Natural Heritage Program have been confirmed within the mine study area.

13.2.2 Transportation-corridor Study Area

The transportation-corridor study area extends eastward from the mine study area, which has a continental climate and relatively gentle topography, and transitions to an area with a maritime climate and steep mountainous terrain. Because of these differences in climate and topography, the typical vegetation also transitions from west to east. Three ecological zones (woodland,

forest, and mountainous shrubland) have been identified in the transportation-corridor study area based on scientists' observations in the field and visual review of the mapping.

Researchers collected data at 1,126 in the transportation-corridor study area. Detailed data were collected at 597 of these locations. The vegetation data collected in the field and site photographs were compared to aerial photo signatures to produce a vegetation map for approximately 20,000 acres. Forty-five Project Vegetation Types were identified in the transportation-corridor mapping area; 42 of these were the same as those found in the mine mapping area, but with different composition percentages.

Forested vegetation types represented 68 percent of the area mapped, with Open Mixed Forest being the most common type. Shrub vegetation types represented 24 percent of the mapping area. Herbaceous vegetation types and unvegetated cover types (including open water) each represented approximately 4 percent of the mapping area. Table 13-2 lists the Grouped Vegetation Types for the transportation-corridor mapping area, with the acreage of each and the percentage of the transportation-corridor mapping area that each type comprises.

Three plant species tracked by the Alaska Natural Heritage Program have been confirmed within the transportation-corridor study area.

13.3 References

- Three Parameters Plus, Inc. (3PPI). 2008. Pebble Project Vegetation Type Photo Signature Guide, Draft Report. Version XVII. Palmer, AK. May.
- Viereck, L.A., C.T. Dyrness, A.R. Batten, and K.J. Wenzlick. 1992. The Alaska Vegetation Classification. General Technical Report PNW-GTR-286. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. Portland, Oregon.
- Wibbenmeyer, M., J. Grunblatt, and L. Shea. 1982. User's Guide for Bristol Bay Land Cover Maps. Bristol Bay Cooperative Management Plan. Alaska Department of Natural Resources and Alaska Department of Fish and Game, Anchorage, AK.

13.4 Glossary

Aerial photo signature—a unique texture, pattern, or color that vegetation has when captured in photographs taken from an airplane.

Herbaceous plants—plants that have leaves and stems that die to the soil level at the end of the growing season.

Non-wetlands—uplands and lowland areas that are neither aquatic habitats, wetlands, nor other special aquatic sites. Non-wetlands are seldom or never inundated, or if frequently inundated, they have saturated soils for only brief periods during the growing season, and if vegetated, they normally support a prevalence of vegetation typically adapted for life only in aerobic soil conditions.

Project Vegetation Types—dominant vegetation types that include typical plant-species composition and vegetation structure.

Voucher specimen—any specimen that serves as a basis of study and is retained as a reference; it should be in a publicly accessible scientific reference collection. For purposes of this study, voucher specimens of Alaska Natural Heritage Program tracked species were collected and sent to the University of Alaska, Fairbanks, herbarium for species verification.

Wetlands—areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands include swamps, marshes, bogs, and similar areas.

Vegetation—Bristol Bay Drainages

TABLE 13-1
Grouped Vegetation Types and their Acreages within the
Mine Mapping Area, Bristol Bay Drainages

Grouped Vegetation Type	Acres ^a	Percent of Mapping Area ^a
Open/Closed Forest	438.9	0.3
Open Tall Shrub	5,143.9	4.0
Closed Tall Shrub	12,416.1	9.7
Open Low Shrub	16,758.6	13.1
Closed Low Shrub	1,612.2	1.3
Dwarf Shrub	67,579.4	52.9
Dry to Moist Herbaceous	6,706.7	5.2
Wet Herbaceous	4,695.1	3.7
Open Water	3,234.4	2.5
Unvegetated Cover Types	9,188.7	7.2
Total Mapping Area	127,773.9	100.0

a. All numbers are rounded. Apparent inconsistencies in sums are the result of rounding.

TABLE 13-2
Grouped Vegetation Types and their Acreages within the
Transportation-corridor Mapping Area, Bristol Bay Drainages

Grouped Vegetation Type	Acres ^a	Percent of Mapping Area ^a
Open/Closed Forest	13,627.0	68.4
Open Tall Shrub	628.2	3.2
Closed Tall Shrub	1,174.9	5.9
Open Low Shrub	1,505.6	7.6
Closed Low Shrub	61.8	0.3
Dwarf Shrub	1,407.5	7.1
Dry to Moist Herbaceous	258.4	1.3
Wet Herbaceous	523.8	2.6
Open Water	600.1	3.0
Unvegetated Cover Types	129.8	0.7
Total Mapping Area	19,917.1	100.0

a. All numbers are rounded. Apparent inconsistencies in sums are the result of rounding.

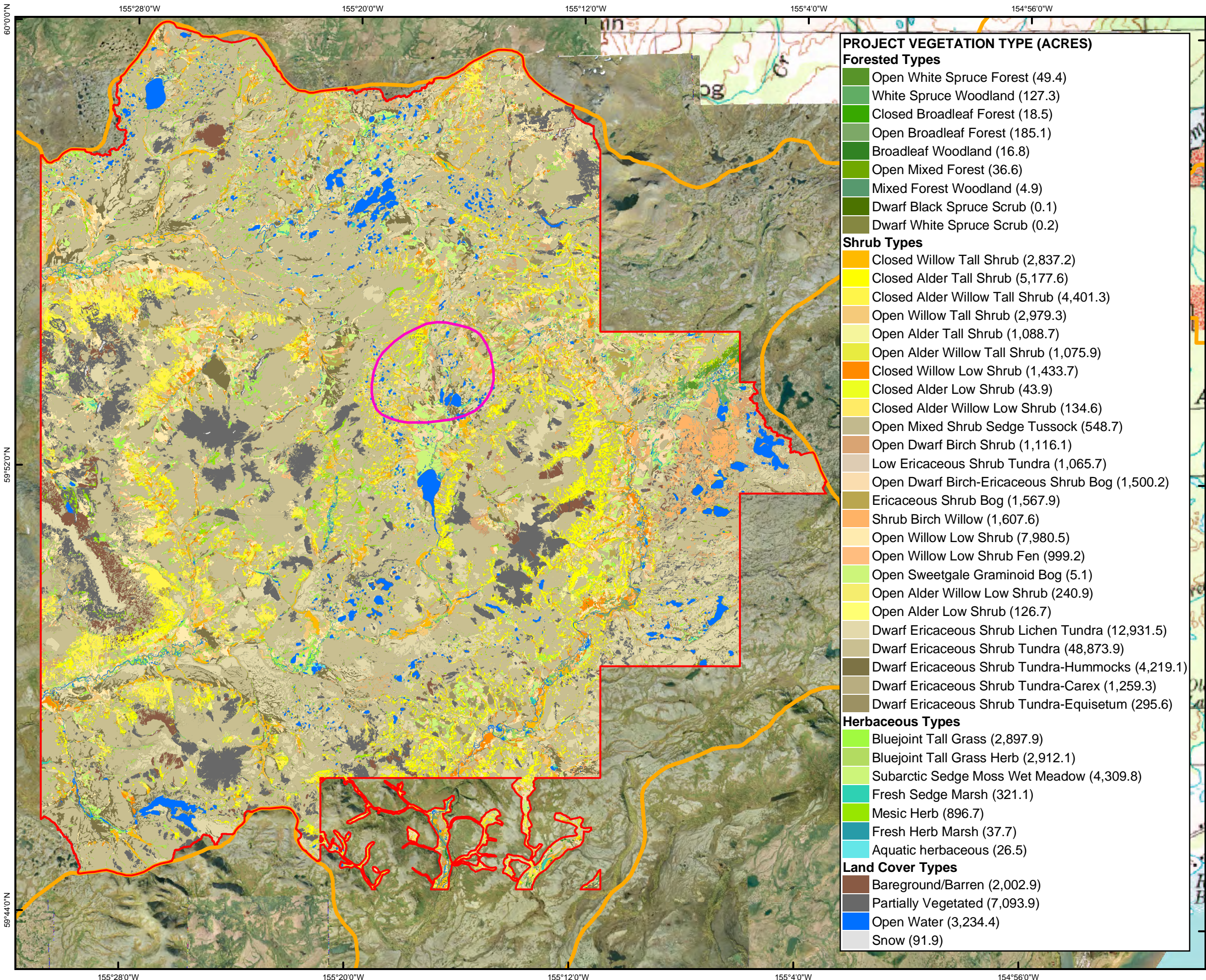
Vegetation—Bristol Bay Drainages



PHOTO 13-1. The most common vegetation type in the mine mapping area: Dwarf Ericaceous Shrub Tundra.



PHOTO 13-2. The most common vegetation type in the transportation-corridor mapping area: Open Mixed Forest.

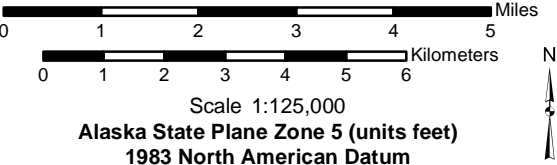


PROJECT VEGETATION TYPE (ACRES)	
Forested Types	
Open White Spruce Forest	(49.4)
White Spruce Woodland	(127.3)
Closed Broadleaf Forest	(18.5)
Open Broadleaf Forest	(185.1)
Broadleaf Woodland	(16.8)
Open Mixed Forest	(36.6)
Mixed Forest Woodland	(4.9)
Dwarf Black Spruce Scrub	(0.1)
Dwarf White Spruce Scrub	(0.2)
Shrub Types	
Closed Willow Tall Shrub	(2,837.2)
Closed Alder Tall Shrub	(5,177.6)
Closed Alder Willow Tall Shrub	(4,401.3)
Open Willow Tall Shrub	(2,979.3)
Open Alder Tall Shrub	(1,088.7)
Open Alder Willow Tall Shrub	(1,075.9)
Closed Willow Low Shrub	(1,433.7)
Closed Alder Low Shrub	(43.9)
Closed Alder Willow Low Shrub	(134.6)
Open Mixed Shrub Sedge Tussock	(548.7)
Open Dwarf Birch Shrub	(1,116.1)
Low Ericaceous Shrub Tundra	(1,065.7)
Open Dwarf Birch-Ericaceous Shrub Bog	(1,500.2)
Ericaceous Shrub Bog	(1,567.9)
Shrub Birch Willow	(1,607.6)
Open Willow Low Shrub	(7,980.5)
Open Willow Low Shrub Fen	(999.2)
Open Sweetgale Graminoid Bog	(5.1)
Open Alder Willow Low Shrub	(240.9)
Open Alder Low Shrub	(126.7)
Dwarf Ericaceous Shrub Lichen Tundra	(12,931.5)
Dwarf Ericaceous Shrub Tundra	(48,873.9)
Dwarf Ericaceous Shrub Tundra-Hummocks	(4,219.1)
Dwarf Ericaceous Shrub Tundra-Carex	(1,259.3)
Dwarf Ericaceous Shrub Tundra-Equisetum	(295.6)
Herbaceous Types	
Bluejoint Tall Grass	(2,897.9)
Bluejoint Tall Grass Herb	(2,912.1)
Subarctic Sedge Moss Wet Meadow	(4,309.8)
Fresh Sedge Marsh	(321.1)
Mesic Herb	(896.7)
Fresh Herb Marsh	(37.7)
Aquatic herbaceous	(26.5)
Land Cover Types	
Bareground/Barren	(2,002.9)
Partially Vegetated	(7,093.9)
Open Water	(3,234.4)
Snow	(91.9)



Figure 13-1
Vegetation Mapping
in the Mine Study Area,
2004-2008

- Legend**
- Mine Mapping Area
 - Mine Study Area
 - General Deposit Location



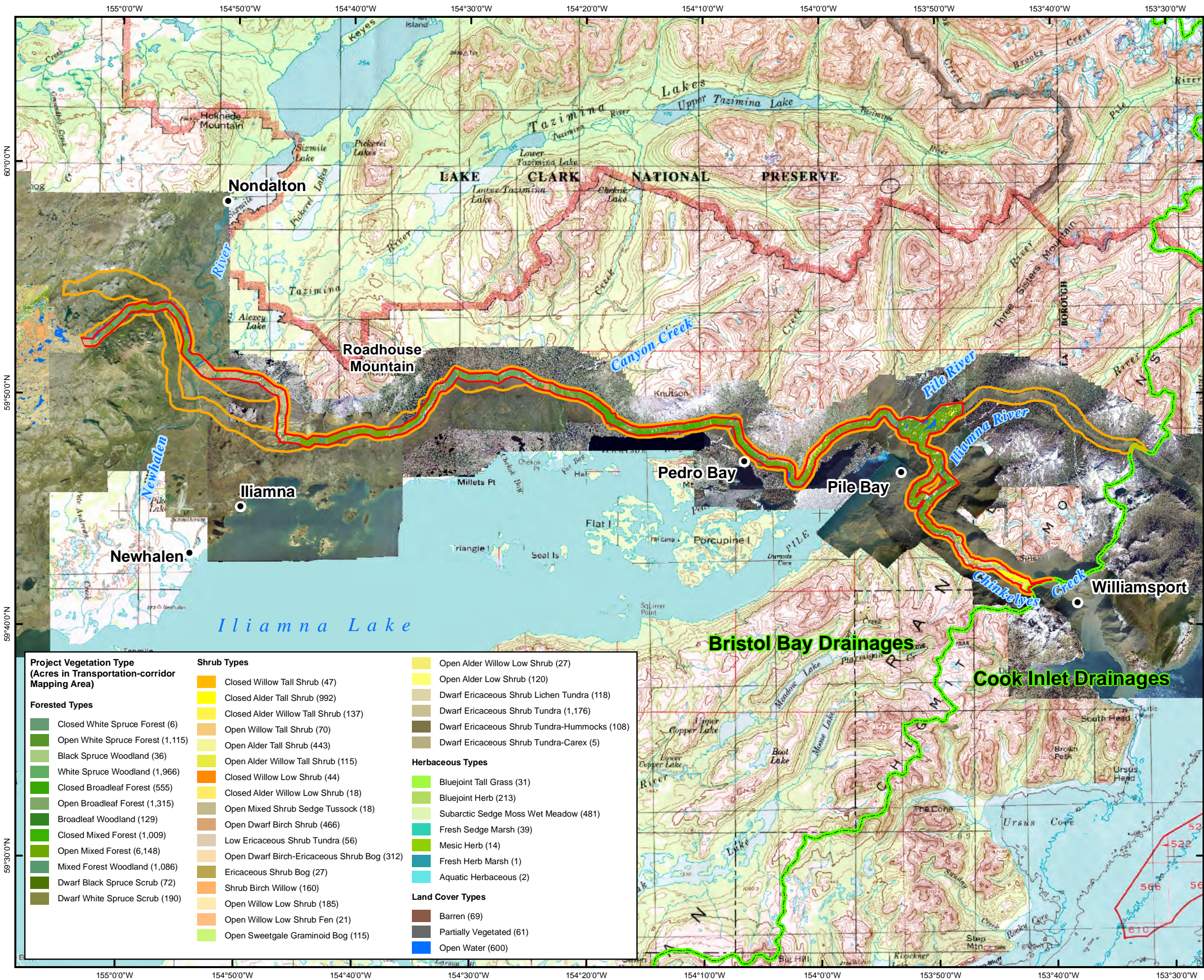


Figure 13-2
Overview
Vegetation Mapping,
Transportation-corridor Mapping Area,
2004-2008

Legend

- Transportation-corridor Mapping Area
- Transportation-corridor Study Area
- Bristol Bay/Cook Inlet Drainages Boundary
- Communities

Project Vegetation Type (Acres in Transportation-corridor Mapping Area)	
Forested Types	
Closed White Spruce Forest (6)	
Open White Spruce Forest (1,115)	
Black Spruce Woodland (36)	
White Spruce Woodland (1,966)	
Closed Broadleaf Forest (555)	
Open Broadleaf Forest (1,315)	
Broadleaf Woodland (129)	
Closed Mixed Forest (1,009)	
Open Mixed Forest (6,148)	
Mixed Forest Woodland (1,086)	
Dwarf Black Spruce Scrub (72)	
Dwarf White Spruce Scrub (190)	
Shrub Types	
Closed Willow Tall Shrub (47)	
Closed Alder Tall Shrub (992)	
Closed Alder Willow Tall Shrub (137)	
Open Willow Tall Shrub (70)	
Open Alder Tall Shrub (443)	
Open Alder Willow Tall Shrub (115)	
Closed Willow Low Shrub (44)	
Closed Alder Willow Low Shrub (18)	
Open Mixed Shrub Sedge Tussock (18)	
Open Dwarf Birch Shrub (466)	
Open Dwarf Birch-Ericaceous Shrub Bog (312)	
Ericaceous Shrub Bog (27)	
Shrub Birch Willow (160)	
Open Willow Low Shrub (185)	
Open Willow Low Shrub Fen (21)	
Open Sweetgale Graminoid Bog (115)	
Open Alder Willow Low Shrub (27)	
Open Alder Low Shrub (120)	
Dwarf Ericaceous Shrub Lichen Tundra (118)	
Dwarf Ericaceous Shrub Tundra (1,176)	
Dwarf Ericaceous Shrub Tundra-Hummocks (108)	
Dwarf Ericaceous Shrub Tundra-Carex (5)	
Herbaceous Types	
Bluejoint Tall Grass (31)	
Bluejoint Herb (213)	
Subarctic Sedge Moss Wet Meadow (481)	
Fresh Sedge Marsh (39)	
Mesic Herb (14)	
Fresh Herb Marsh (1)	
Aquatic Herbaceous (2)	
Land Cover Types	
Barren (69)	
Partially Vegetated (61)	
Open Water (600)	

Bristol Bay Drainages

Cook Inlet Drainages



0 2 4 6 8 10 Miles
0 5 10 15 Kilometers

Scale 1:300,000
Alaska State Plane Zone 5 (units feet)
1983 North American Datum

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